



Biology - 9700

■ 100 Questions

Topics Covered :

- ✓ 5.1 - Replication and division of nuclei and cells
- ✓ 5.2 - Chromosome behaviour in mitosis

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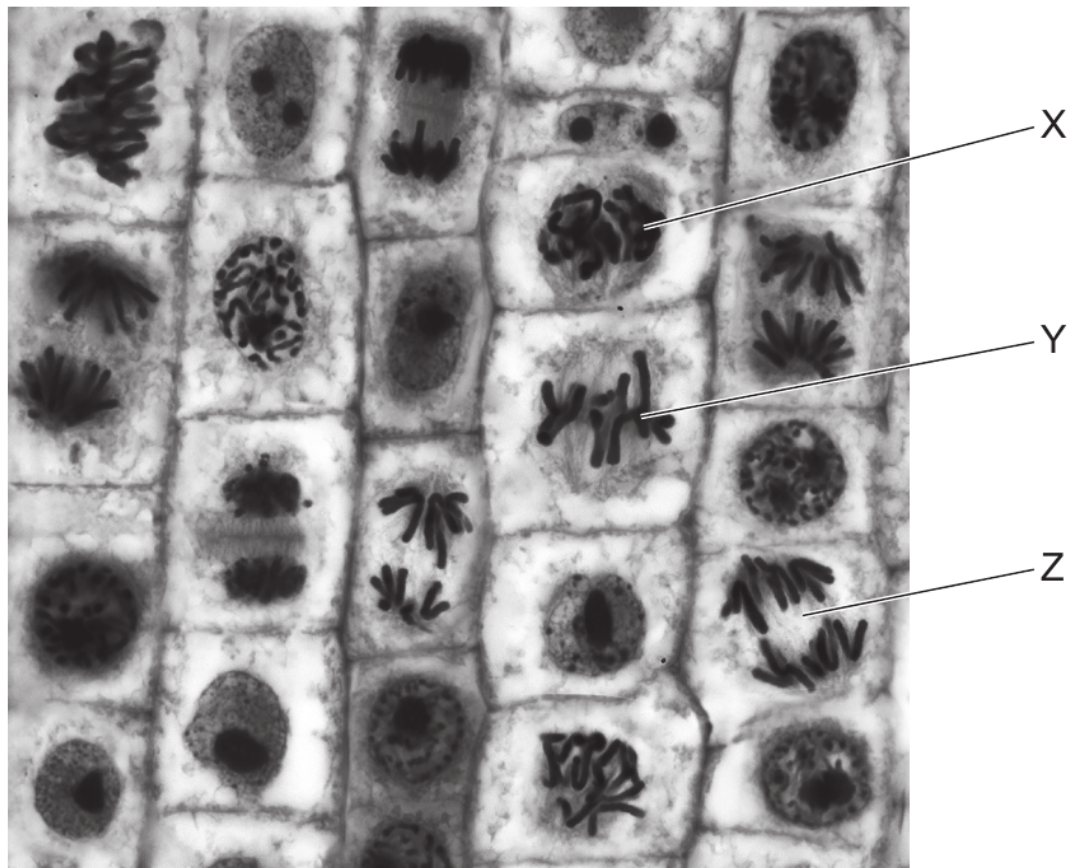
Question No 1 - (9700_w24_13_18)

Which process does **not** involve mitosis?

- A** asexual reproduction
- B** growth of unicellular organisms
- C** repair of tissues by cell replacement
- D** replacement of damaged or dead cells

Question No 2 - (9700_w24_13_19)

The photomicrograph shows cells in an onion root tip.

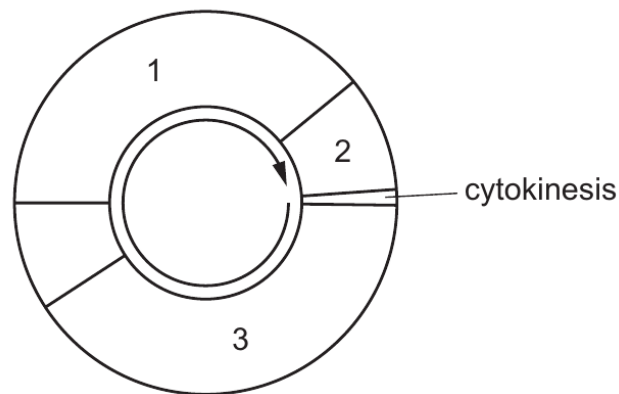


Which labelled cells are in anaphase, metaphase and prophase?

	anaphase	metaphase	prophase
A	X	Y	Z
B	Y	Z	X
C	Z	X	Y
D	Z	Y	X

Question No 3 - (9700_w24_13_20)

The diagram shows an outline of the mitotic cell cycle.



Which numbered stages of the cell cycle include a period of time when each chromosome consists of sister chromatids joined by a centromere?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 only

Question No 4 - (9700_w24_12_18)

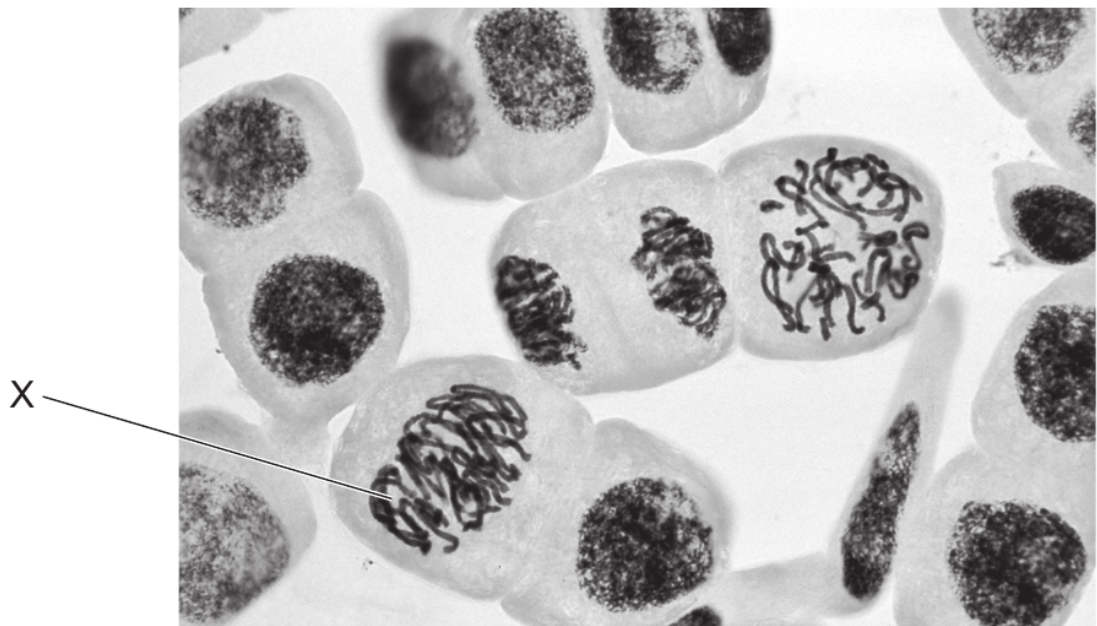
Chickens have 78 chromosomes in the nucleus of a body cell.

How many DNA molecules are there in a chicken body cell at the start of prophase of mitosis?

- A** 46 **B** 78 **C** 92 **D** 156

Question No 5 - (9700_w24_12_19)

The photomicrograph shows cells undergoing mitosis.



Which statement describes what will happen next in cell X?

- A** Chromatin coils up tightly and the nuclear envelope breaks down.
- B** Chromosomes line up along the equator of the cell and attach to the spindle.
- C** Sister chromatids move towards opposite poles, pulled by the spindle fibres.
- D** Spindle fibres break down and the cell prepares for cytokinesis.

Question No 6 - (9700_w24_12_20)

Which processes occur in bone marrow cells that are in a mitotic cell cycle?

- 1 Phosphate groups bind to ADP molecules to form ATP.
- 2 Bonds form between nucleotides in a DNA strand.
- 3 Hydrogen bonds form between tRNA anticodons and mRNA codons.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

Question No 7 - (9700_w24_12_21)

The enzyme telomerase prevents loss of telomeres after many mitotic cell cycles.

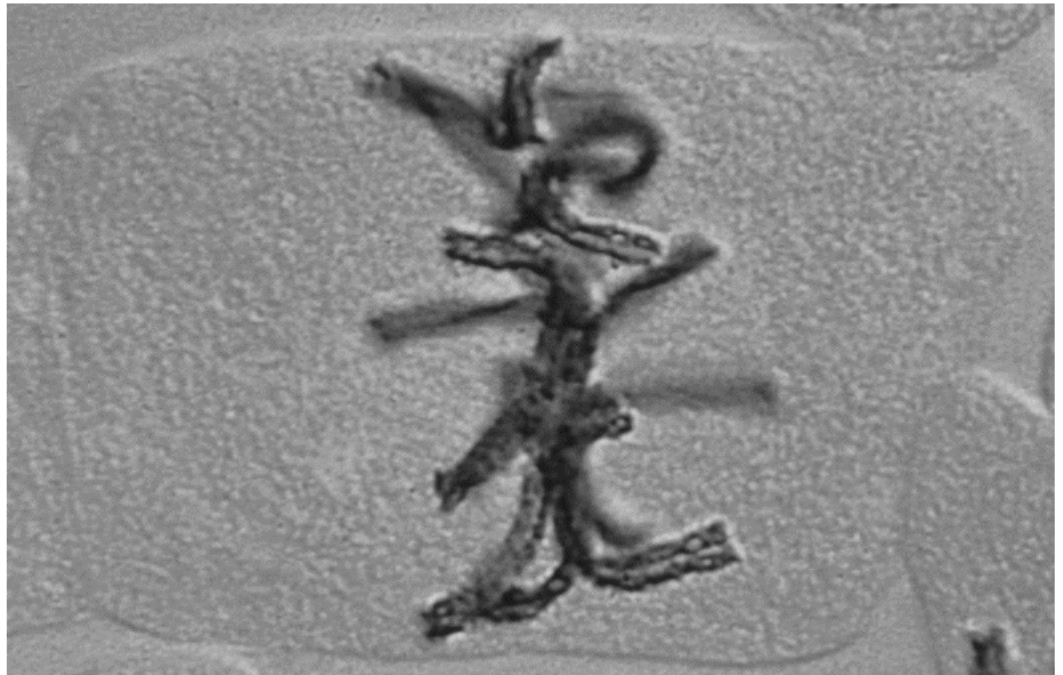
Which cells need to transcribe telomerase enzyme?

- 1 stem cells
- 2 activated memory B-lymphocytes
- 3 helper T-lymphocytes secreting cytokines

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 8 - (9700_w24_11_20)

The photomicrograph shows a stage of mitosis.



What would be correct for the next stage in mitosis?

	two sister chromatids remain attached	nuclear membrane
A	no	not present
B	no	re-forming
C	yes	not present
D	yes	breaking down

Question No 9 - (9700_w24_11_21)

What are the correct roles of mitosis?

	stem cell growth	replacing lost skin cells
A	✓	✗
B	✓	✓
C	✗	✗
D	✗	✓

key

✓ = correct

✗ = **not** correct

Question No 10 - (9700_w24_11_22)

Which row about the stages of the mitotic cell cycle is correct?

	DNA ligase used in the nucleus	RNA polymerase used in the nucleus
A	G ₁ phase	S phase
B	G ₂ phase	mitosis
C	mitosis	G ₂ phase
D	S phase	G ₁ phase

Question No 11 - (9700_w24_11_24)

There are 64 chromosomes in the muscle cells of a particular mammal.

How many DNA molecules are present in a cell during early prophase and telophase of mitosis?

	early prophase	telophase
A	64	32
B	64	64
C	128	128
D	128	64

Question No 12 - (9700_m16_12_16)

Which statements about the cell cycle are correct?

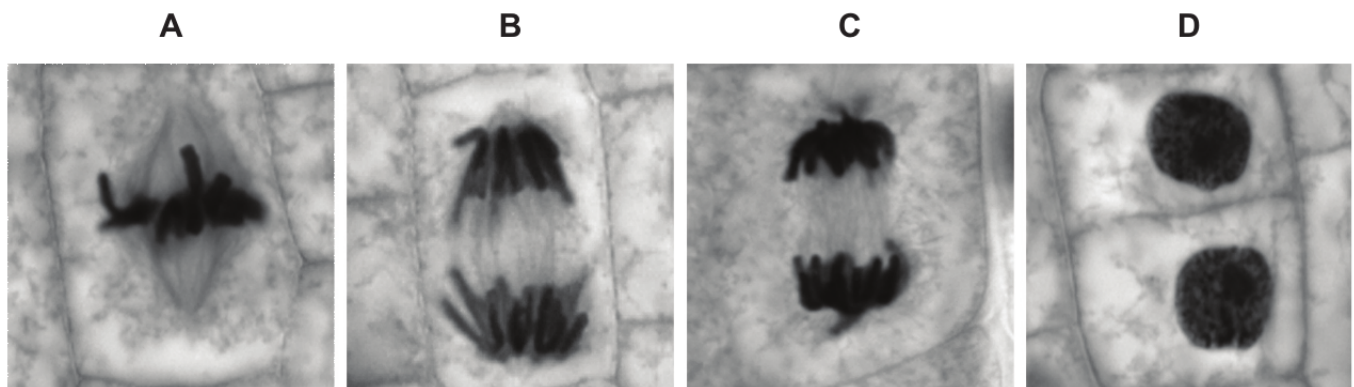
- 1 The cell cycle consists of both interphase and mitosis.
- 2 DNA replication takes place in interphase.
- 3 A cell can remain in interphase for several months.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 13 - (9700_m16_12_17)

The diagram shows cells in different stages of the cell cycle.

Which is the last stage before cytokinesis?

**Question No 14 - (9700_m16_12_18)**

How many of the listed structures typically contain genetic material that has telomeres?

- bacterial cell
- chloroplast
- mitochondrion
- nucleus

A 1 **B** 2 **C** 3 **D** 4

Question No 15 - (9700_s24_13_17)

The contents of a daughter cell are compared to the parent cell after one cell cycle.

Which row is correct?

	number of chromosomes	volume of cytoplasm	length of telomeres
A	increases	remains the same	decreases
B	increases	decreases	remains the same
C	remains the same	remains the same	remains the same
D	remains the same	decreases	decreases

Question No 16 - (9700_s24_13_18)

A high-power photomicrograph shows a cell in a stage of mitosis.

The chromosomes are visible and lined up along the cell equator but there is no nuclear envelope.

Which stage of mitosis is shown by the photomicrograph?

- A** prophase
- B** metaphase
- C** anaphase
- D** telophase

Question No 17 - (9700_s24_13_20)

A scientist stains the chromosomes of a plant cell with a fluorescent dye to observe the telomeres.

This cell has 38 chromosomes.

How many telomeres will the scientist observe in one of the nuclei during telophase of mitosis?

- A** 38 **B** 76 **C** 114 **D** 152

Question No 18 - (9700_s24_12_18)

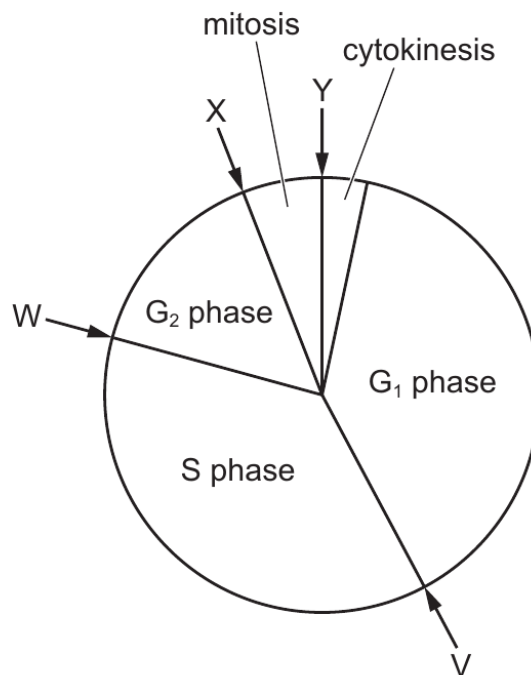
Which metabolic processes will be very active in a cell that has just completed cytokinesis?

- 1 ATP formation
- 2 DNA replication
- 3 protein synthesis

- A** 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 3 only

Question No 19 - (9700_s24_12_19)

The diagram shows a typical mitotic cell cycle and the point in the cell cycle that has been reached by each of four cells, V, W, X and Y.



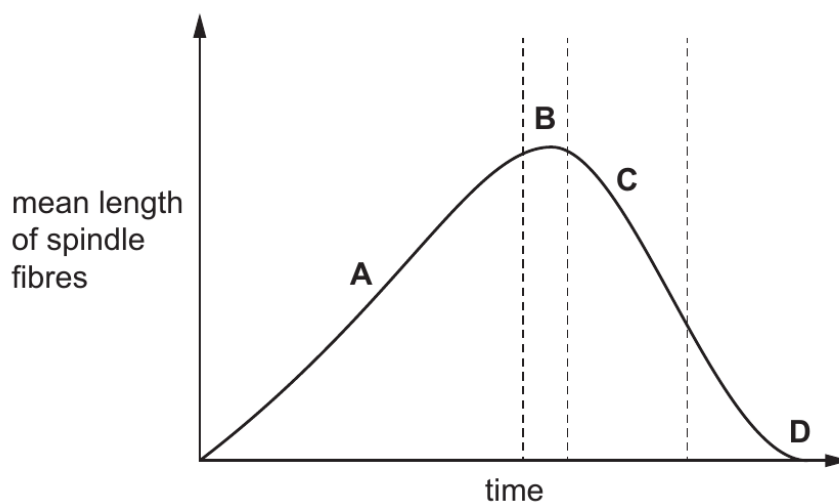
Which row correctly identifies the cells that match the two descriptions?

	DNA replication is complete but the cell has not yet reached its maximum size	preparation for microtubule formation is nearly complete but chromosomes have not yet condensed
A	V	X
B	W	Y
C	V	Y
D	W	X

Question No 20 - (9700_s24_12_20)

The graph shows the mean length of the spindle fibres during mitosis.

Which region of the graph shows when all the centromeres have detached from the spindle fibres?

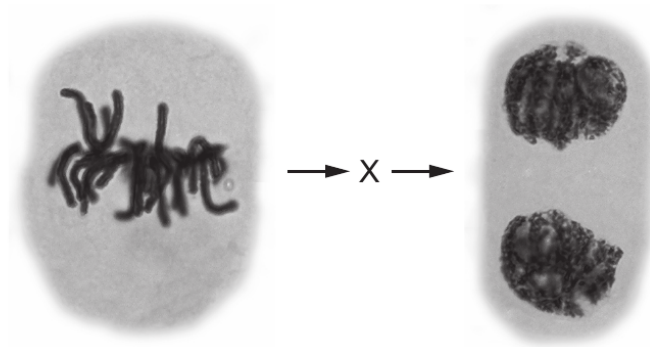
**Question No 21 - (9700_s24_11_17)**

Which row is correct for stem cells?

	can repair cells	can be involved in the formation of phagocytes
A	yes	no
B	yes	yes
C	no	no
D	no	yes

Question No 22 - (9700_s24_11_18)

Eukaryotic organisms grow and increase in size as a result of cell division. The diagram shows some stages of mitosis with one stage missing, labelled X.

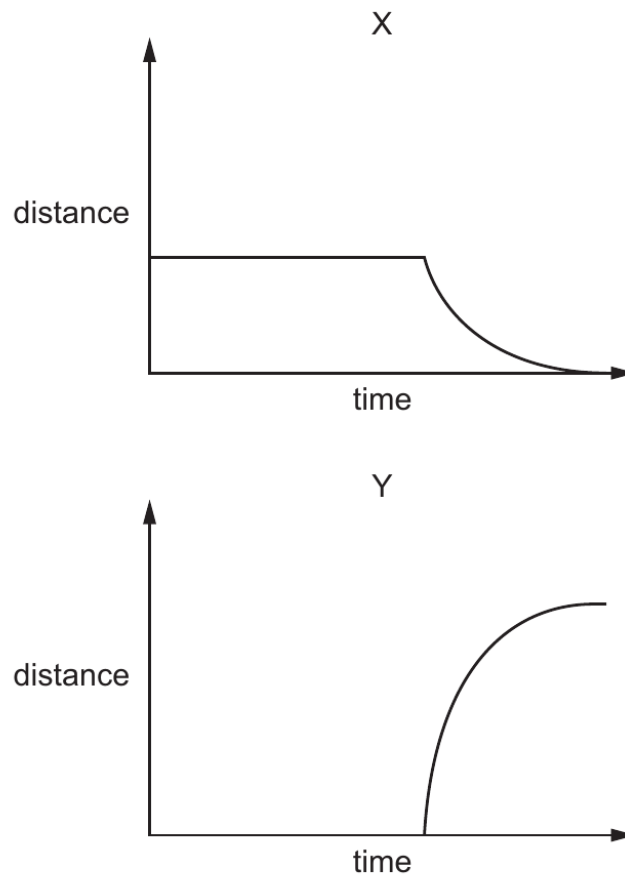


What happens in stage X?

- A** Spindle fibres attach to the centromeres and the chromosomes line up along the equator.
- B** The chromatin coils and condenses and the nuclear membrane disintegrates.
- C** The chromosomes line up in pairs along the equator of the cell.
- D** Microtubules shorten so that spindle fibres contract and the centromeres divide.

Question No 23 - (9700_s24_11_19)

The graphs show various distance measurements taken from the start of metaphase of mitosis. The graphs are to scale when compared to one another.



Which row correctly identifies the distance measurement for each graph?

	X	Y
A	distance between poles of spindle	distance of centromeres from poles of spindle
B	distance between poles of spindle	distance between sister chromatids
C	distance of centromeres from poles of spindle	distance between sister chromatids
D	distance of centromeres from poles of spindle	distance between poles of spindle

Question No 24 - (9700_s24_11_20)

Which row is correct for the start of anaphase of mitosis?

	form of DNA	DNA is associated with histone proteins	state of the cell surface membrane
A	chromosomes	always	broken apart
B	chromosomes	sometimes	intact
C	separated sister chromatids	always	intact
D	separated sister chromatids	sometimes	broken apart

Question No 25 - (9700_m24_12_20)

During sperm formation in mammals, part of the structure of each chromosome is replaced with proteins called protamines. This replacement allows the DNA to be packaged much more densely than would otherwise be possible.

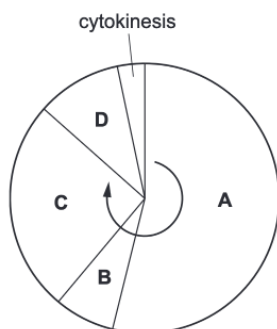
Which part of the chromosome is replaced by protamines?

- A** centromeres
- B** chromatids
- C** histones
- D** telomeres

Question No 26 - (9700_m24_12_21)

The diagram shows the mitotic cell cycle.

During which phase do chromosomes condense and become visible?



Question No 27 - (9700_m24_12_22)

Which statements correctly describe features of stem cells that are essential for their role in cell replacement and tissue repair?

- 1 After mitosis of stem cells, the daughter cells can either remain as stem cells or follow a developmental pathway that leads to the formation of specialised cells.
- 2 Stem cells are different to all other body cells because they retain all of the genetic information in their DNA throughout the life of the organism.
- 3 A small population of stem cells is retained in the body of adults throughout their life time.
- 4 Stem cells have more telomeres than other body cells and this allows them to undergo an unlimited number of mitotic divisions.

- A** 1, 2, 3 and 4
- B** 1, 2 and 3 only
- C** 1 and 3 only
- D** 2, 3 and 4 only

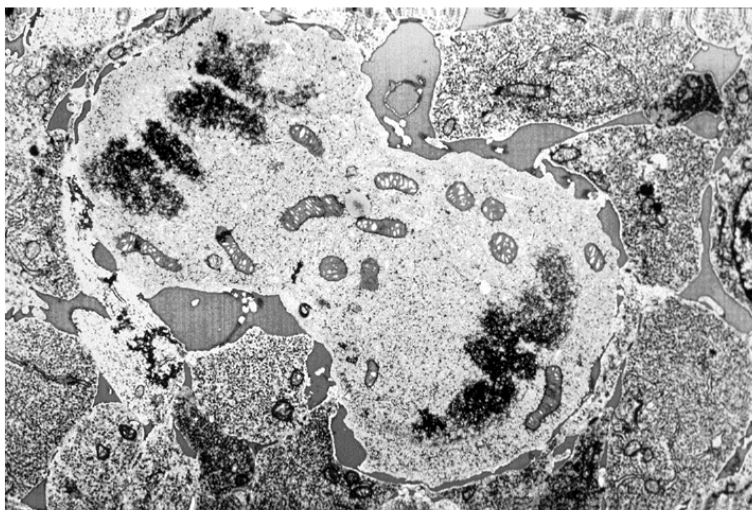
Question No 28 - (9700_w23_13_20)

Which statement about the behaviour of chromosomes during telophase is correct?

- A** Chromosomes attach to the spindle fibres at the equator.
- B** Chromosomes start to uncoil inside the newly formed nucleus.
- C** Chromosomes move towards the opposite poles of the cell.
- D** Chromosomes condense into compact structures in the cytoplasm.

Question No 29 - (9700_w23_13_21)

The transmission electron micrograph shows a cell in a stage of the mitotic cell cycle.



Which statement explains why it is difficult to identify the stage of the mitotic cell cycle shown?

- A** Chromosomes have supercoiled and are visible, but centrioles are not visible.
- B** Anaphase may be continuing, or telophase may be starting.
- C** It is unclear whether the electron micrograph shows two cells in metaphase.
- D** Some people may consider interphase to have started.

Question No 30 - (9700_w23_12_18)

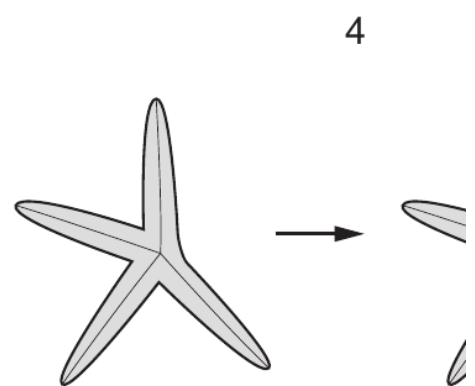
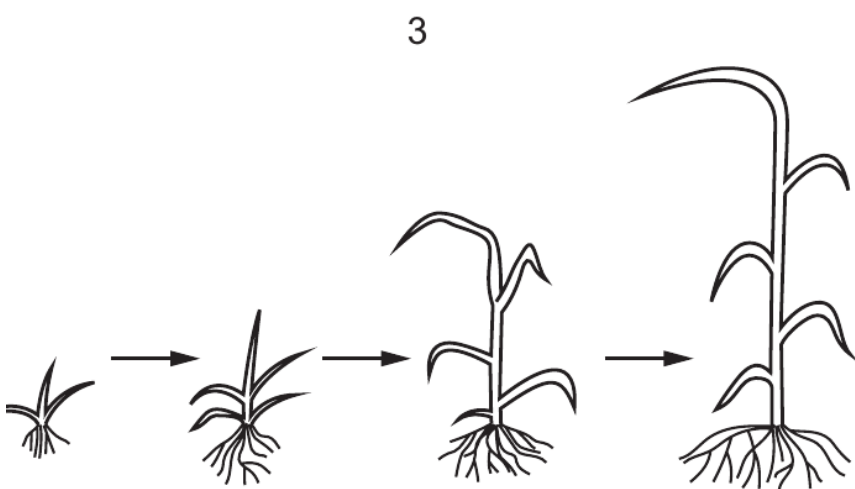
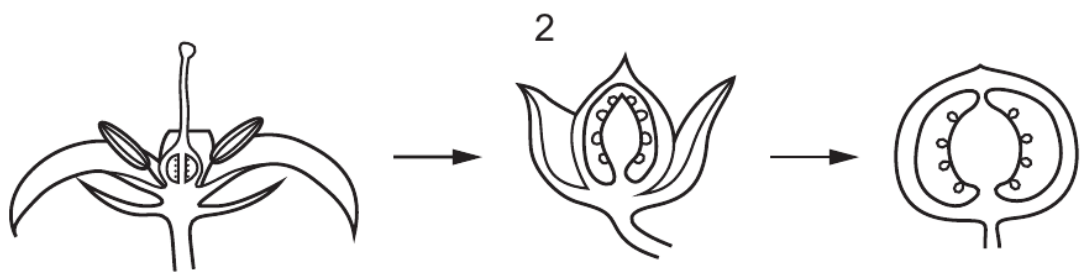
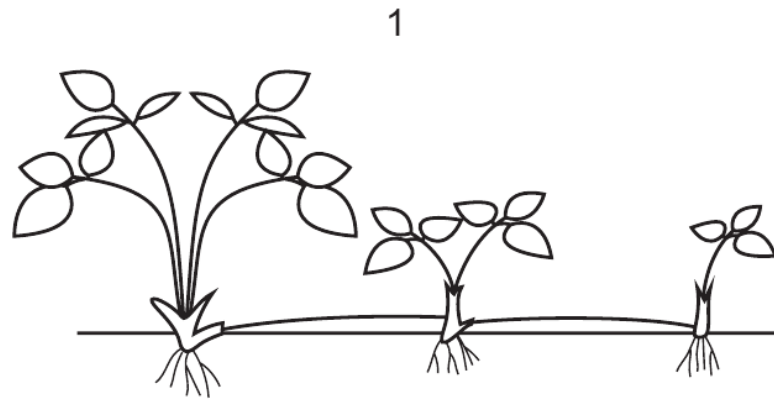
A human embryo consists of 12 cells at the start of day 1. The cells divide by mitosis for 4 complete days at a rate of 1 division every 32 hours.

What is the maximum number of cells in the embryo at the end of day 4?

- A** 48 cells
- B** 96 cells
- C** 192 cells
- D** 384 cells

Question No 31 - (9700_w23_12_19)

Which diagrams show roles of mitosis?



- A** 1, 2, 3 and 4
- B** 1, 2 and 3 only
- C** 1 and 2 only
- D** 3 and 4 only

Question No 32 - (9700_w23_12_20)

Which events are part of the mitotic cell cycle?

- 1 interphase
- 2 anaphase
- 3 cytokinesis

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

Question No 33 - (9700_w23_11_21)

The photomicrograph shows a cell during mitosis.



What is happening in this cell?

- 1 Chromosomes are condensing.
- 2 Centromeres are moving to opposite poles.
- 3 Spindle microtubules are shortening.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

Question No 34 - (9700_s23_13_21)

Which row describes some properties of stem cells?

	able to divide by mitosis to produce more stem cells	able to differentiate into specialised cells	able to repair damaged cells
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✗
D	✗	✗	✓

key

✓ = is a property

✗ = is not a property

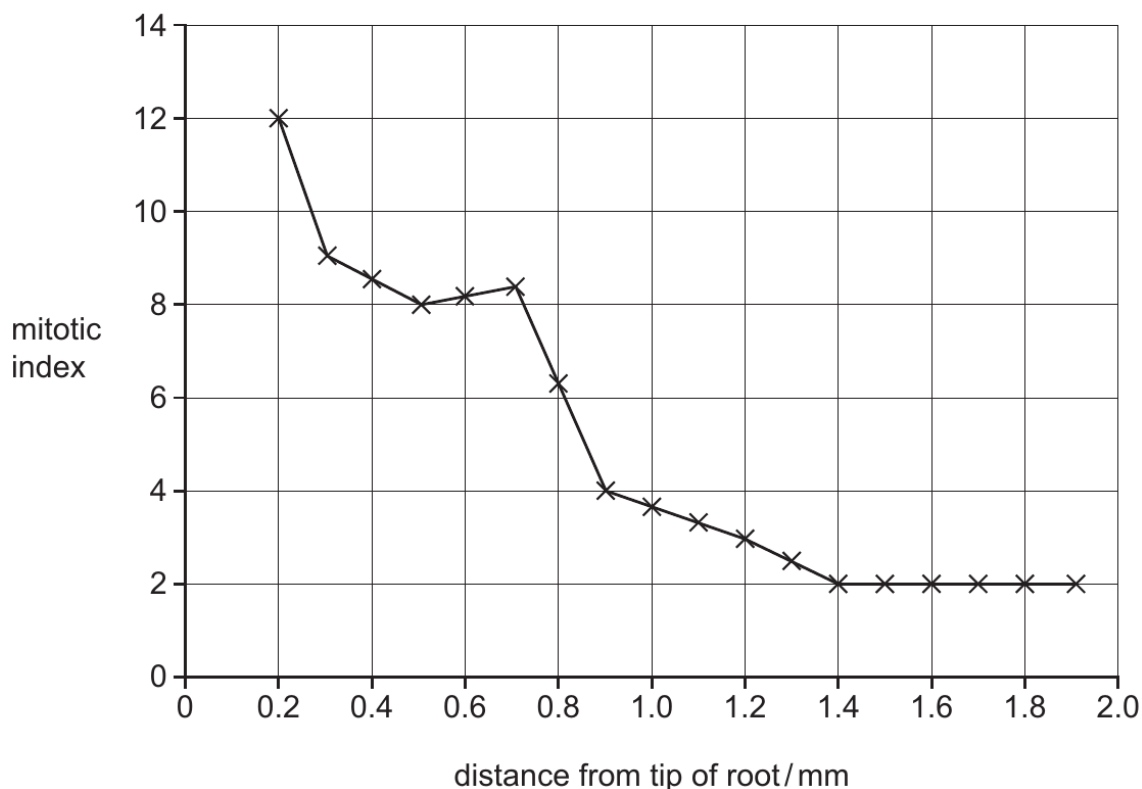
Question No 35 - (9700_s23_13_22)

The mitotic index is a measure of the proportion of cells that are undergoing mitosis in an area of tissue. It is calculated using the formula shown.

$$\text{mitotic index} = (\text{number of cells undergoing mitosis} \div \text{total number of cells}) \times 100$$

A scientist calculated the mitotic index of areas of onion root at different distances from the tip of the root.

The results are shown.

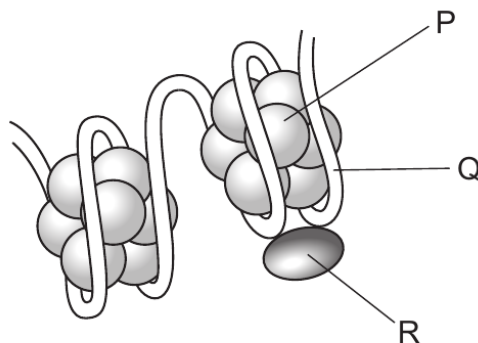


Which statement is correct?

- A** No cell division occurs further than 1.4 mm from the tip of the root.
- B** The rate of cell division decreases as the distance from the root tip decreases.
- C** Most of the cells undergoing cell division are closer to the tip of the root.
- D** For a sample of 200 cells 0.2 mm from the tip of the root, 6 would be undergoing mitosis.

Question No 36 - (9700_s23_12_20)

The diagram shows part of the organisation of a section of a DNA molecule and the associated histones, P and R, in prophase of mitosis.



Which statement about the features labelled P, Q and R during prophase of mitosis is correct?

- A** The coiled DNA molecule forms Q and wraps around histone R to form small clusters held in place by histone P.
- B** The groups of histones, P, and its associated DNA, Q, move closer together as the chromosome condenses around R.
- C** The histones P and R are made of protein around which the DNA molecule, Q, is wrapped so that the DNA molecule can fit inside the nucleus.
- D** The linked groups of histones P and R and the associated DNA, Q, form strands that fold and twist together to form a chromatid.

Question No 37 - (9700_s23_12_21)

How many copies of each DNA molecule will be found in a cell at the **start** of the stages of the mitotic cell cycle shown?

	G ₁ of interphase	cytokinesis
A	1	1
B	1	2
C	2	1
D	2	2

Question No 38 - (9700_s23_11_17)

The cell cycle includes mitosis.

What are features of this type of nuclear division?

- 1 forms cells of equal size to the parent cell
- 2 forms genetically identical nuclei
- 3 semi-conservative replication of DNA

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

Question No 39 - (9700_s23_11_18)

A student observed the cells in the growing region (meristem) of an onion root and obtained the data shown.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

Which percentage of cells contains chromosomes that appear as two chromatids?

A 7.3% **B** 8.9% **C** 95.9% **D** 97.5%

Question No 40 - (9700_m23_12_19)

Which events are part of the mitotic cell cycle?

- 1 interphase
- 2 telophase
- 3 cytokinesis

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 41 - (9700_m23_12_20)

The estimated total number of red blood cells in the human body is 2.5×10^{13} .

It is estimated that, each day, 2.5×10^{11} red blood cells are removed from the circulation and are replaced by stem cells in the bone marrow.

Which percentage of the total number of red blood cells is replaced each day?

A 0.01% **B** 0.1% **C** 1% **D** 10%

Question No 42 - (9700_w22_13_18)

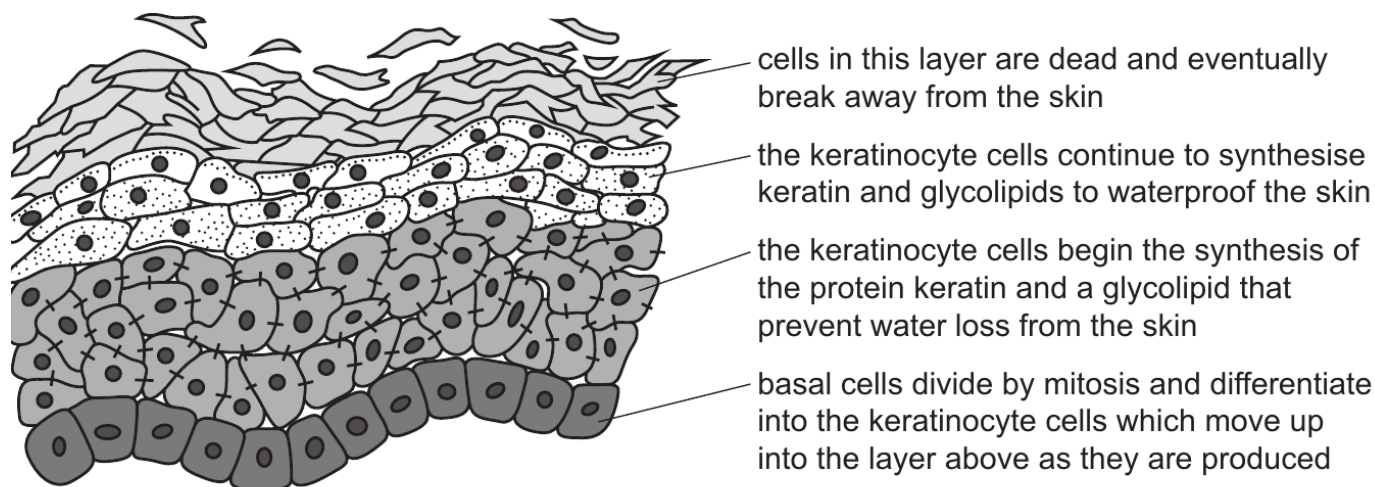
Which row shows the correct number of each component in a single chromosome at the start of telophase of mitosis?

	centromeres	polynucleotide strands	telomeres
A	1	2	2
B	1	4	4
C	2	4	2
D	2	2	4

Question No 43 - (9700_w22_13_20)

The diagram shows the epidermis of human skin. This is formed of four layers of cells.

Cells in each layer have specific functions which are outlined on the diagram. As the cells are produced, they move upwards as shown by the arrow.

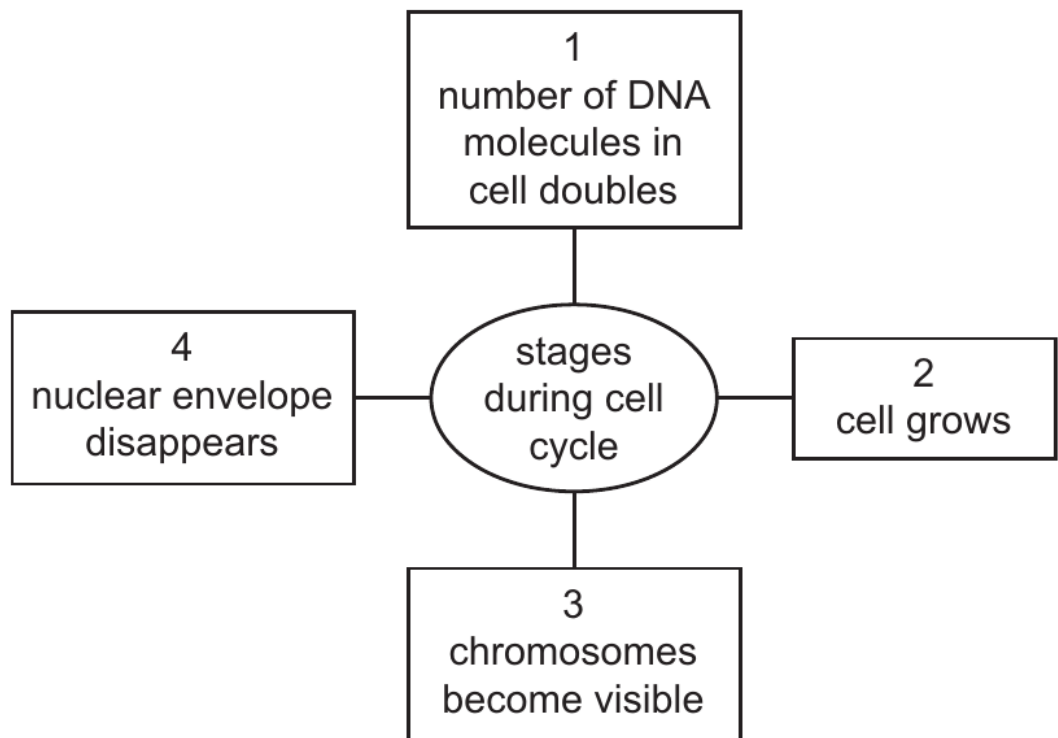


Which row shows cells that are acting as stem cells in the skin epidermis and an organelle needed by the keratinocytes?

	cells that are acting as stem cells	organelle needed by the keratinocytes
A	basal cells only	centrioles
B	basal cells only	Golgi body
C	basal cells and keratinocytes	centrioles
D	basal cells and keratinocytes	Golgi body

Question No 44 - (9700_w22_13_21)

The diagram shows some of the stages that take place during the cell cycle.



Which two stages take place during interphase?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

Question No 45 - (9700_w22_12_18)

The enzyme telomerase prevents loss of telomeres after many mitotic cell cycles.

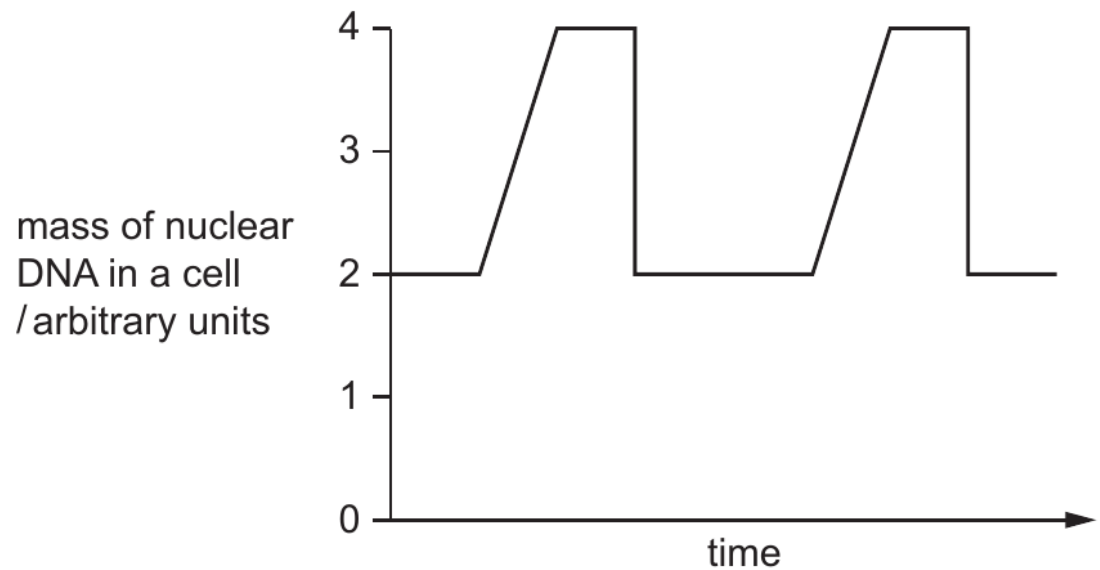
Which cells need to transcribe telomerase enzyme?

- 1 cancer cells
- 2 stem cells
- 3 activated memory B-lymphocytes

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 46 - (9700_w22_12_19)

Which processes that occur in the cell cycle are represented in the diagram?



- A** DNA replication and nuclear division only
- B** DNA replication, nuclear division and cytokinesis
- C** mitosis and cytokinesis
- D** mitosis only

Question No 47 - (9700_w22_12_21)

Stained onion cells undergoing mitosis were observed using a microscope.

Which row is correct for mitosis in plant cells?

	prophase	metaphase	anaphase	telophase
A	centrioles visible	chromosomes pair up at the equator	two telomeres are visible on each chromatid	two nuclear membranes form
B	centromeres present	chromosomes align at the equator	chromosomes replicate to form chromatids	centrioles disappear
C	each chromosome is visible as two chromatids	centromeres attach to spindle fibres	chromatids separate and migrate to opposite poles	chromosomes decondense
D	spindle fibres formed by centrioles	centromeres attach to spindle fibres	chromatids are pulled apart by centrioles	spindle fibres form new nuclear membranes

Question No 48 - (9700_w22_11_18)

How many of these processes produce genetically identical cells?

- growth of plant roots
- replacement of dead human skin cells
- repair of damaged muscle tissue
- asexual reproduction of coral

A 1

B 2

C 3

D 4

Question No 49 - (9700_w22_11_19)

Which row shows the correct number of each component of a single chromosome at the end of prophase of mitosis?

	centromeres	chromatids	polynucleotide strands	telomeres
A	1	0	2	2
B	1	2	4	4
C	2	0	4	2
D	2	2	2	4

Question No 50 - (9700_w22_11_20)

Which processes occur during interphase?

- 1 DNA replication
- 2 microtubule organisation
- 3 synthesis of ribosomes

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 51 - (9700_w22_11_21)

Embryonic stem cells are able to replicate continuously.

What happens to the telomeres during repeated mitotic cell cycles of embryonic stem cells?

- A** Their lengths increase.
B Their lengths decrease.
C They are completely lost.
D They stay the same length.

Question No 52 - (9700_w22_11_22)

Which nitrogenous bases are pyrimidines?

- A** adenine and thymine
- B** cytosine and guanine
- C** thymine and uracil
- D** uracil and guanine

Question No 53 - (9700_s22_13_18)

Some cells are listed.

- 1 bacterial cells
- 2 cancer cells
- 3 lymphocytes
- 4 mature red blood cells
- 5 stem cells

Which cells can divide by mitosis?

- A** 1, 2, 4 and 5
- B** 1, 2 and 3
- C** 2, 3 and 5
- D** 3, 4 and 5

Question No 54 - (9700_s22_13_19)

Which statements about mitosis are correct?

- 1 At the end of telophase, two nuclei are formed.
- 2 Centrioles attach chromosomes to the spindle during metaphase.
- 3 Chromatids are pulled apart during anaphase.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

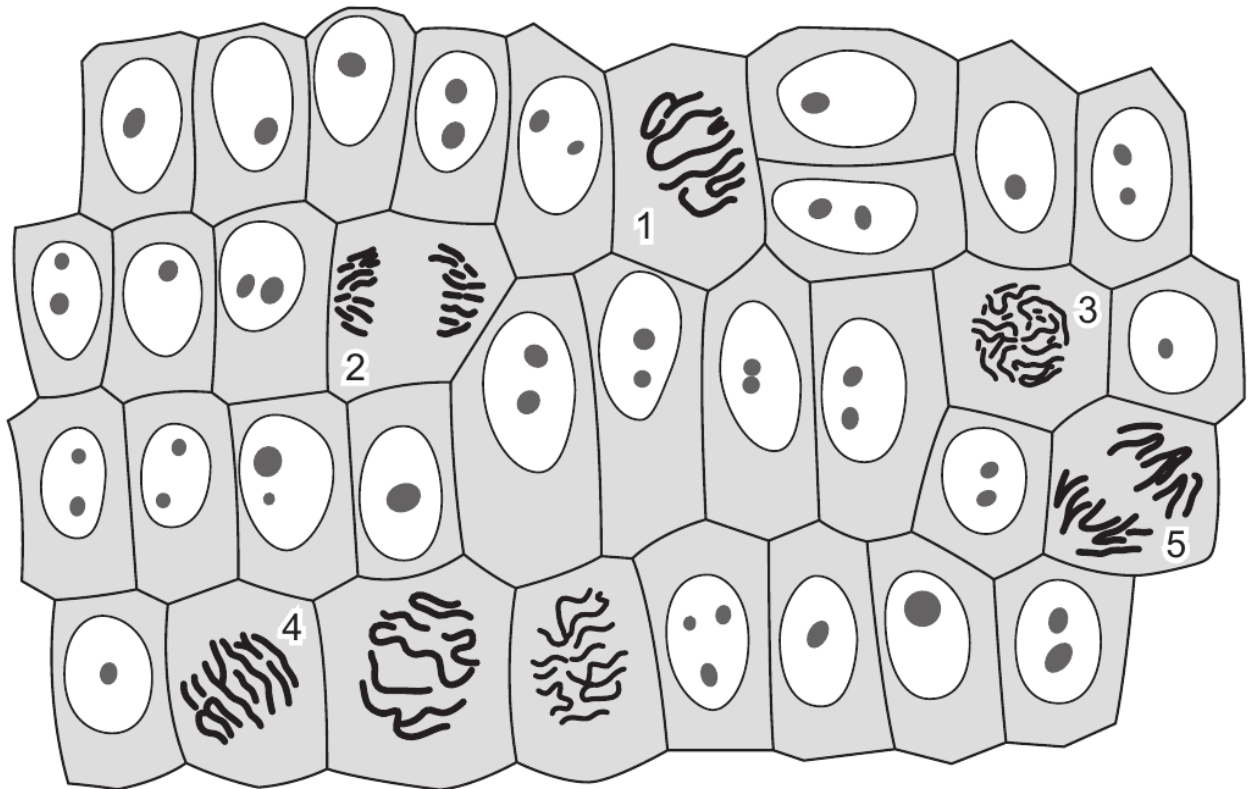
Question No 55 - (9700_s22_13_20)

Which statement about telomeres is correct?

- A** They allow cells in culture from any age of donor to divide a fixed number of times.
- B** They are genes which are present on the 5' end of every chromosome.
- C** They are unpaired regions of DNA on the 3' end of every chromosome.
- D** They prevent introns and exons being lost from genes during cell division.

Question No 56 - (9700_s22_13_21)

The diagram shows stages of mitosis.



What is the correct sequence of the stages of mitosis numbered on the diagram?

- A** 1 → 3 → 4 → 2 → 5
- B** 1 → 3 → 4 → 5 → 2
- C** 3 → 1 → 4 → 5 → 2
- D** 3 → 4 → 1 → 2 → 5

Question No 57 - (9700_s22_12_17)

What is a role of mitosis?

- A** growth of organisms
- B** production of genetically different cells
- C** repair of cells
- D** replacement of cancerous tissue

Question No 58 - (9700_s22_12_18)

Telomeres prevent the loss of genes from the ends of chromosomes during DNA replication, but they become shorter each time they are copied.

In cancer cells and stem cells, the telomeres remain the same length.

Which statement is correct for **all** human cells?

- A** If telomeres become too short, a cell may stop dividing.
- B** Adding telomeres could increase the rate of ageing of cells.
- C** Telomeres are repaired by the enzyme RNA polymerase.
- D** Telomeres prevent all damage occurring to DNA molecules.

Question No 59 - (9700_s22_12_19)

The nucleus of a mouse body cell in G_1 phase of the cell cycle has 1.2×10^{-12} g of DNA.

What will be the mass of DNA in the nucleus of the cell at the end of S phase and at the end of G_2 phase of the cell cycle?

	end of S phase	end of G_2 phase
A	1.2×10^{-12} g	1.2×10^{-12} g
B	1.2×10^{-12} g	2.4×10^{-12} g
C	2.4×10^{-12} g	1.2×10^{-12} g
D	2.4×10^{-12} g	2.4×10^{-12} g

Question No 60 - (9700_s22_12_20)

What occurs during prophase in animal cells?

- 1 fragmentation of the nuclear envelope
- 2 nucleolus disappears
- 3 stained chromosomes become visible
- 4 centrioles replicate

- A** 1, 2, 3 and 4
B 1, 2 and 3 only
C 2 and 3 only
D 1 and 4 only

Question No 61 - (9700_s22_11_18)

Which processes require mitosis?

- 1 the cloning of T-lymphocytes
- 2 the repair of cell structures by protein synthesis
- 3 the growth of multicellular organisms from a single cell
- 4 the reproduction of a unicellular eukaryote

- A** 1, 2 and 3 **B** 1, 3 and 4 **C** 1 and 2 only **D** 3 and 4 only

Question No 62 - (9700_s22_11_19)

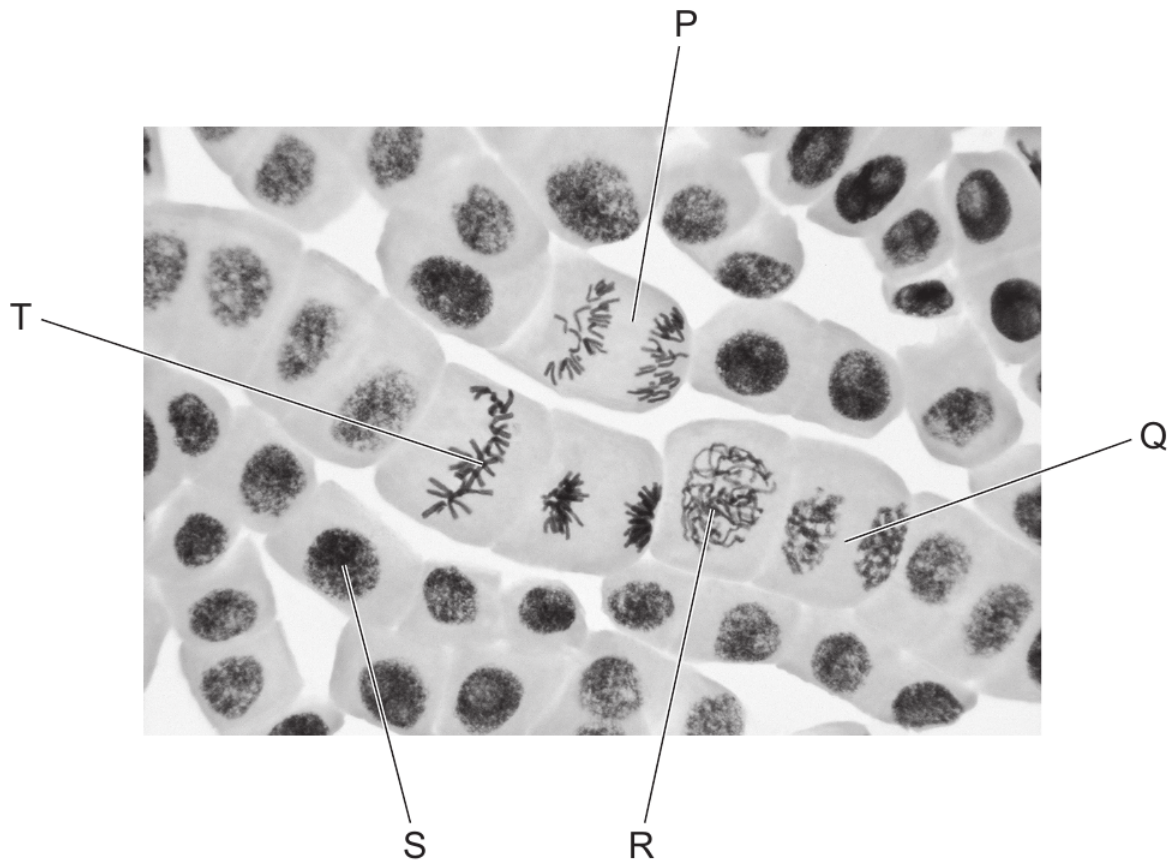
Which events listed are part of the cell cycle?

- 1 interphase
- 2 prophase
- 3 cytokinesis

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 63 - (9700_s22_11_21)

The photomicrograph shows cells at different stages of mitosis.



A student wrote four statements about the photomicrograph.

- 1 Cell P shows anaphase.
- 2 Spindle formation is occurring in cell Q.
- 3 The amount of DNA in cell R is the same as in cell T.
- 4 The correct order for the stages is $S \rightarrow R \rightarrow T \rightarrow P \rightarrow Q$.

Which statements are correct?

- A** 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

Question No 64 - (9700_m22_12_20)

The protein p53 is produced in a cell in response to DNA damage. This protein stops the cell cycle for a short time just before the DNA is replicated, so that the DNA can be repaired.

At which phase of the cell cycle will this stop occur?

- A** M **B** G₁ **C** S **D** G₂

Question No 65 - (9700_m22_12_21)

Some parts of a typical human chromosome are more numerous than others.

Which parts are listed in order from the most numerous to the least numerous?

- A** centromere, nucleotide, histone
B DNA molecule, telomere, centromere
C histone, telomere, DNA molecule
D telomere, centromere, nucleotide

Question No 66 - (9700_m22_12_22)

Which row correctly describes a stage of mitosis?

	stage of mitosis	nuclear envelope	centromeres	spindle
A	prophase	disappears	replicate	spindle microtubules begin to form
B	metaphase	not present	move to the poles of the cell	spindle microtubules fully formed
C	anaphase	begins to reform	split into two	some spindle microtubules shorten
D	telophase	reforms	at maximum distance from cell equator	spindle microtubules break down

Question No 67 - (9700_w21_13_18)

Which row shows the correct number of each component of a single chromatid during anaphase of mitosis?

	centromeres	polynucleotide strands	telomeres
A	1	2	2
B	1	4	4
C	2	2	4
D	2	4	2

Question No 68 - (9700_w21_13_19)

Some processes are listed.

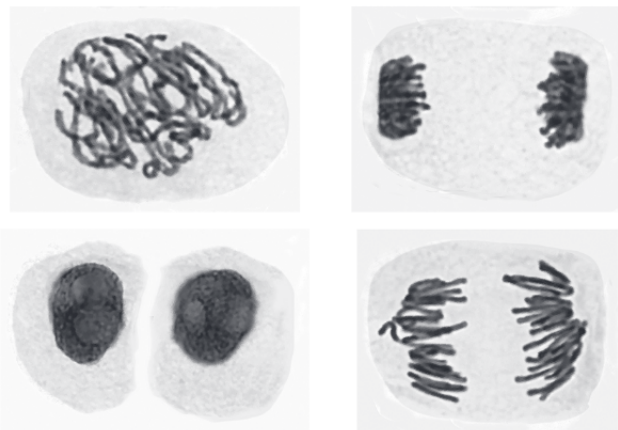
- cytokinesis
- differentiation
- DNA replication
- mitosis

How many of the listed processes occur during tissue repair by stem cells?

A 1 **B** 2 **C** 3 **D** 4

Question No 69 - (9700_w21_13_20)

The photomicrographs show cells in various stages of the cell cycle.



Which stage of mitosis is **not** shown?

- A anaphase
- B prophase
- C metaphase
- D telophase

Question No 70 - (9700_w21_12_18)

Which description is correct?

- A A centromere holds two chromatids together until the end of prophase and attaches to the microtubules of the spindle.
- B A chromatid is one of two identical parts of a chromosome and is made of proteins and two molecules of DNA.
- C A chromosome is a structure with two identical parts, made of DNA and proteins, found in the nucleus of a prokaryotic cell.
- D A telomere is a sequence of DNA nucleotides, such as GGGTAA, repeated many times and found at the ends of each chromatid.

Question No 71 - (9700_w21_12_19)

During metaphase, a scientist stains the chromosomes of a diploid animal cell with fluorescent dye to allow the telomeres to be observed.

This cell has 26 chromosomes.

How many telomeres will the scientist observe?

- A** 26 **B** 52 **C** 78 **D** 104

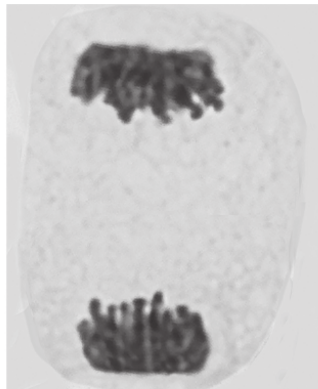
Question No 72 - (9700_w21_12_20)

The photomicrographs show cells in various stages of the cell cycle.

1



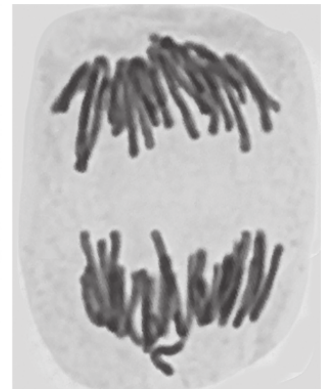
2



3



4



Which cells contain twice as many DNA molecules as a cell from the same organism that has just finished a complete mitotic cell cycle ending with cytokinesis?

- A** 1, 2, 3 and 4
B 1, 2 and 4 only
C 1 and 3 only
D 2 and 4 only

Question No 73 - (9700_w21_12_21)

Uncontrolled cell division can result in the formation of a tumour.

Which part of the cell cycle would take less time during the formation of a tumour?

- A** cytokinesis
- B** interphase
- C** mitosis
- D** telophase

Question No 74 - (9700_w21_11_17)

What will be present in each chromosome at the end of the G_2 phase of the cell cycle?

- A** two centrioles
- B** two centromeres
- C** two molecules of DNA
- D** two telomeres

Question No 75 - (9700_w21_11_18)

Which events listed are part of the cell cycle?

- 1 interphase
- 2 metaphase
- 3 cytokinesis

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 76 - (9700_w21_11_19)

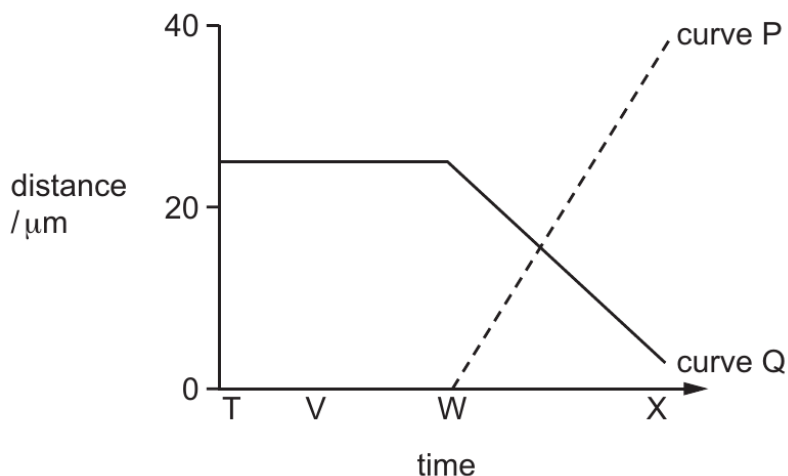
Which features of an organism are affected by a drug that kills cells that are dividing mitotically?

- 1 cell repair
- 2 cell replacement
- 3 number of stem cells
- 4 tissue repair
- 5 tumour formation

- A** 1, 2, 3, 4 and 5
- B** 1, 2 and 3 only
- C** 1, 4 and 5 only
- D** 2, 3, 4 and 5 only

Question No 77 - (9700_w21_11_20)

The graph shows how the distance between sister chromatids (curve P) and the distance between chromatids and centrioles (curve Q) changes during part of mitosis.



Which statements could be correct?

- 1 T to V represents interphase.
- 2 T to W represents metaphase.
- 3 W to X represents anaphase.

A 1 and 3 **B** 2 and 3 **C** 1 only **D** 2 only

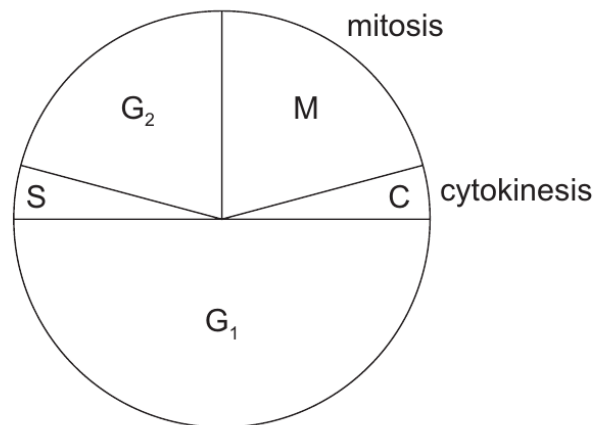
Question No 78 - (9700_s21_13_18)

How many copies of each different DNA molecule are found in a cell at the start of each of these stages of the mitotic cell cycle?

	G ₂ of interphase	prophase	cytokinesis
A	1	1	2
B	1	2	1
C	2	1	2
D	2	2	2

Question No 79 - (9700_s21_12_18)

The diagram represents the cell cycle of a human cell. During the cell cycle the number of chromatids changes.



Which row is correct for the number of chromatids in M, G₁, and G₂?

	M	G ₁	G ₂
A	46	46	92
B	46	92	92
C	92	46	92
D	92	92	92

Question No 80 - (9700_s21_12_19)

A single skin cell was isolated and transferred to growth medium in a sterile Petri dish. The Petri dish was incubated for 16 days. During this time, the number of skin cells multiplied as a result of repeated mitotic divisions.

One of the chromosomes in the nucleus of each skin cell has a telomere that contains many repeats of the base sequence TTAGGG. On each of days 4, 8, 12 and 16 of the incubation period, a single cell was removed from the Petri dish. The total number of bases in the telomere of this chromosome was determined for each cell. Each of the four cells had a different total number of telomere bases for this chromosome: 5548, 5580, 5645 and 5700.

What was the total number of telomere bases in the chromosome from the cell that had undergone the most mitotic divisions?

- A** 5548 **B** 5580 **C** 5645 **D** 5700

Question No 81 - (9700_s21_11_18)

The jellyfish, *Turritopsis dohrnii*, is described as being immortal. If *T. dohrnii* is not eaten by predators or diseased, it seems to be able to live forever. There is no way to determine the biological age of a *T. dohrnii* individual.

Which feature of the cells in *T. dohrnii* could explain these observations?

- A** very long G phases in the cell cycle
B a very short S phase in the cell cycle
C an ability to restore telomeres to their original length
D fewer chromosomes than other eukaryotic organisms

Question No 82 - (9700_s21_11_19)

Some chemicals, used to stop tumour growth, work by preventing the DNA double helix from uncoiling and separating.

During which stage of the cell cycle would they act?

- A** anaphase
- B** interphase
- C** metaphase
- D** prophase

Question No 83 - (9700_m21_12_19)

Which statements about mitosis are correct?

- 1 Mitosis results in genetically identical cells.
- 2 Mitosis is involved in asexual reproduction.
- 3 Mitosis occurs immediately after cytokinesis.
- 4 Mitosis can be used to repair damaged cells.

- A** 1, 2, 3 and 4
- B** 1, 2 and 4 only
- C** 1 and 2 only
- D** 3 and 4 only

Question No 84 - (9700_w20_13_19)

Three parts of a chromosome and their functions are listed.

part		function	
p1	centromere	f1	holds the coils of DNA together
p2	histone proteins	f2	holds two chromatids together
p3	telomere	f3	prevents loss of genes

Which part is matched with its correct function?

- A** p1 and f2 **B** p2 and f2 **C** p2 and f3 **D** p3 and f1

Question No 85 - (9700_w20_13_20)

Which features of mitosis are important for a single-celled organism?

- 1 asexual reproduction
- 2 production of genetically identical cells
- 3 growth

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 86 - (9700_w20_13_21)

Some events in the cell cycle are listed.

Which events are part of mitosis?

- 1 interphase
- 2 metaphase
- 3 cytokinesis

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 only

Question No 87 - (9700_w20_12_17)

During the cell cycle, the mass of DNA in a cell is doubled.

At which stage in the cell cycle is the mass of DNA in a cell reduced?

- A** anaphase
- B** cytokinesis
- C** interphase
- D** prophase

Question No 88 - (9700_w20_12_18)

How many of the listed structures typically contain genetic material that has telomeres?

- bacterial cell
- chloroplast
- mitochondrion
- nucleus

A 1**B** 2**C** 3**D** 4**Question No 89 - (9700_w20_12_19)**

In eukaryotes, the chromosomes become shorter and thicker during mitosis. The thickening may be increased by molecules called protamines. The protamines replace part of the structure of the chromosome.

Which part of the chromosome is replaced by protamines?

- A** centromeres
- B** chromatids
- C** histones
- D** telomeres

Question No 90 - (9700_w20_11_18)

During telophase of mitosis, a scientist stains the chromosomes of a diploid animal cell with a fluorescent dye to observe the telomeres.

This cell has 22 chromosomes.

How many telomeres will the scientist observe in one of the nuclei?

A 22**B** 44**C** 66**D** 88

Question No 91 - (9700_w20_11_19)

Methotrexate is a drug used to treat cancer. It can act as an enzyme inhibitor preventing the synthesis of nucleotides containing thymine.

Cells treated with methotrexate are not able to complete the cell cycle.

A cell entering telophase is treated with methotrexate.

Which stage of the cell cycle will be affected by the action of methotrexate?

- A** anaphase
- B** interphase
- C** metaphase
- D** prophase

Question No 92 - (9700_w20_11_20)

Which stage of mitosis is correctly described?

- A** In anaphase chromosomes line up across the equator.
- B** In metaphase the centrosomes replicate.
- C** In prophase chromatids move to opposite poles.
- D** In telophase chromosomes uncoil to form chromatin.

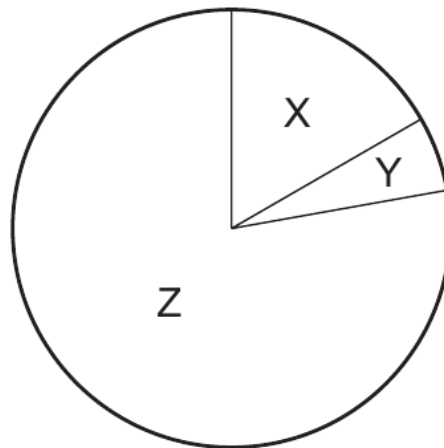
Question No 93 - (9700_s20_13_17)

Which row correctly describes parts of chromosome structure present during mitosis?

	centromere	chromatid	telomere
A	region of a chromosome with no DNA	single DNA polynucleotide with histone proteins	region of DNA with many cytosine and guanine bases
B	region of non-coding DNA holding two chromatids together	double-stranded DNA molecule with histone proteins	region of DNA with many short repeated sequences of bases
C	region of DNA with no histone proteins that allows separation of chromatids during anaphase	DNA molecule coiled round histone proteins to form a chain of nucleosomes	region of DNA with no proteins that protects the end of a chromatid
D	region that attaches to spindle microtubules and divides during prophase	one of two identical DNA molecules that was replicated during interphase	region of non-coding DNA holding the ends of the chromatids together

Question No 94 - (9700_s20_13_18)

The diagram shows the relative time taken for each stage in the cell cycle.



Which row identifies the correct sequence of the stages in the cell cycle?

	cytokinesis	interphase	mitosis
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

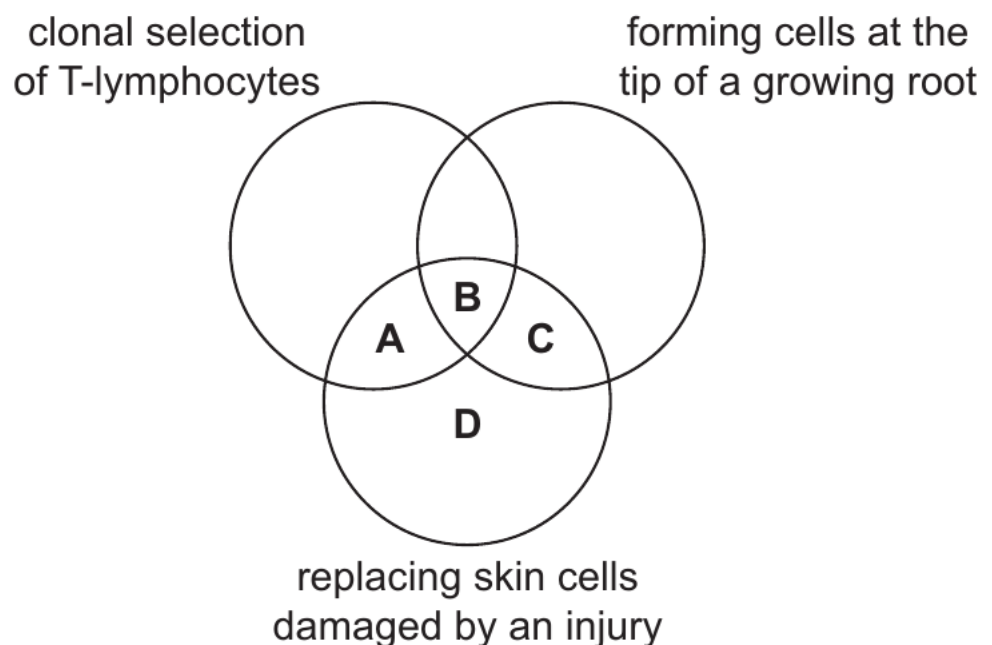
Question No 95 - (9700_s20_12_19)

Which description of chromosome structure is correct?

- A** A chromosome at the beginning of interphase consists of two identical chromatids, each containing one linear molecule of DNA.
- B** Telomeres are lengths of non-coding DNA found at one end of each chromatid to prevent loss of genes during cell division.
- C** The two identical chromatids of a chromosome are held together by a centromere in which there is no DNA.
- D** The very long DNA molecule of each chromatid is coiled and held together by proteins called histones.

Question No 96 - (9700_s20_12_20)

Which processes involve mitosis?



Question No 97 - (9700_s20_12_21)

A drug has been developed to treat certain types of cancer. It prevents mitosis by binding to the spindle and preventing sister chromatids being separated and moving to opposite poles of the cell.

The photomicrograph shows cells in different phases of mitosis.



What represents the stages of mitosis that will be able to occur in a cell which is entering prophase when treated with this drug?

- A** 1 and 2 **B** 2 and 3 **C** 2 only **D** 3 and 4

Question No 98 - (9700_s20_11_17)

Which feature of stem cells enables them to replace cells in tissues such as the skin?

- A** They are undifferentiated cells that are present at birth.
B They differentiate to form skin cells.
C They divide by mitosis to supply some cells that can differentiate.
D They have the full number of chromosomes.

Question No 99 - (9700_s20_11_18)

During prophase, a scientist stains the chromosomes of a diploid animal cell with a fluorescent dye to stain telomeres. This cell has 32 chromosomes.

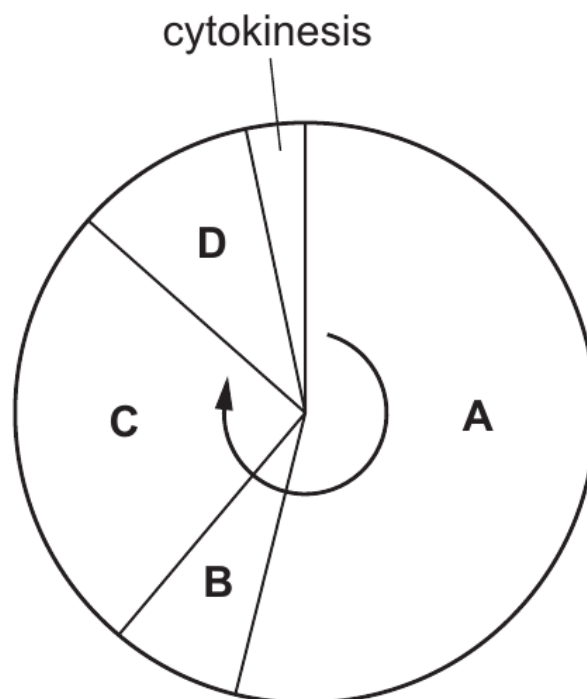
How many telomeres will the scientist observe?

- A** 32 **B** 64 **C** 96 **D** 128

Question No 100 - (9700_s20_11_19)

The diagram shows the cell cycle.

During which phase do chromosomes condense and become visible?



Correct Answers for MCQs

Question 1 (9700_w24_13_18) : B
Question 2 (9700_w24_13_19) : D
Question 3 (9700_w24_13_20) : A
Question 4 (9700_w24_12_18) : D
Question 5 (9700_w24_12_19) : B
Question 6 (9700_w24_12_20) : A
Question 7 (9700_w24_12_21) : B
Question 8 (9700_w24_11_20) : A
Question 9 (9700_w24_11_21) : D
Question 10 (9700_w24_11_22) : D
Question 11 (9700_w24_11_24) : C
Question 12 (9700_m16_12_16) : A
Question 13 (9700_m16_12_17) : C
Question 14 (9700_m16_12_18) : A
Question 15 (9700_s24_13_17) : D
Question 16 (9700_s24_13_18) : B
Question 17 (9700_s24_13_20) : B
Question 18 (9700_s24_12_18) : B
Question 19 (9700_s24_12_19) : D
Question 20 (9700_s24_12_20) : D
Question 21 (9700_s24_11_17) : D
Question 22 (9700_s24_11_18) : D
Question 23 (9700_s24_11_19) : C
Question 24 (9700_s24_11_20) : C
Question 25 (9700_m24_12_20) : C
Question 26 (9700_m24_12_21) : D
Question 27 (9700_m24_12_22) : C
Question 28 (9700_w23_13_20) : B
Question 29 (9700_w23_13_21) : B
Question 30 (9700_w23_12_18) : B
Question 31 (9700_w23_12_19) : A
Question 32 (9700_w23_12_20) : A
Question 33 (9700_w23_11_21) : C
Question 34 (9700_s23_13_21) : B
Question 35 (9700_s23_13_22) : C
Question 36 (9700_s23_12_20) : D

Question 37 (9700_s23_12_21) : B
Question 38 (9700_s23_11_17) : D
Question 39 (9700_s23_11_18) : B
Question 40 (9700_m23_12_19) : A
Question 41 (9700_m23_12_20) : C
Question 42 (9700_w22_13_18) : A
Question 43 (9700_w22_13_20) : B
Question 44 (9700_w22_13_21) : A
Question 45 (9700_w22_12_18) : A
Question 46 (9700_w22_12_19) : B
Question 47 (9700_w22_12_21) : C
Question 48 (9700_w22_11_18) : D
Question 49 (9700_w22_11_19) : B
Question 50 (9700_w22_11_20) : C
Question 51 (9700_w22_11_21) : D
Question 52 (9700_w22_11_22) : C
Question 53 (9700_s22_13_18) : C
Question 54 (9700_s22_13_19) : C
Question 55 (9700_s22_13_20) : D
Question 56 (9700_s22_13_21) : C
Question 57 (9700_s22_12_17) : A
Question 58 (9700_s22_12_18) : A
Question 59 (9700_s22_12_19) : D
Question 60 (9700_s22_12_20) : B
Question 61 (9700_s22_11_18) : B
Question 62 (9700_s22_11_19) : A
Question 63 (9700_s22_11_21) : C
Question 64 (9700_m22_12_20) : B
Question 65 (9700_m22_12_21) : C
Question 66 (9700_m22_12_22) : D
Question 67 (9700_w21_13_18) : A
Question 68 (9700_w21_13_19) : D
Question 69 (9700_w21_13_20) : C
Question 70 (9700_w21_12_18) : D
Question 71 (9700_w21_12_19) : D
Question 72 (9700_w21_12_20) : A
Question 73 (9700_w21_12_21) : B
Question 74 (9700_w21_11_17) : C

Question 75 (9700_w21_11_18) : A
Question 76 (9700_w21_11_19) : D
Question 77 (9700_w21_11_20) : B
Question 78 (9700_s21_13_18) : D
Question 79 (9700_s21_12_18) : C
Question 80 (9700_s21_12_19) : A
Question 81 (9700_s21_11_18) : C
Question 82 (9700_s21_11_19) : B
Question 83 (9700_m21_12_19) : C
Question 84 (9700_w20_13_19) : A
Question 85 (9700_w20_13_20) : B
Question 86 (9700_w20_13_21) : D
Question 87 (9700_w20_12_17) : B
Question 88 (9700_w20_12_18) : A
Question 89 (9700_w20_12_19) : C
Question 90 (9700_w20_11_18) : B
Question 91 (9700_w20_11_19) : B
Question 92 (9700_w20_11_20) : D
Question 93 (9700_s20_13_17) : B
Question 94 (9700_s20_13_18) : C
Question 95 (9700_s20_12_19) : D
Question 96 (9700_s20_12_20) : C
Question 97 (9700_s20_12_21) : A
Question 98 (9700_s20_11_17) : C
Question 99 (9700_s20_11_18) : D
Question 100 (9700_s20_11_19) : D